

CLAIMS

1. An optical rotation angle measuring apparatus comprising:

5 a linearly polarized light output section that outputs a linearly polarized light;

a first phase modulation section, having a first polarization axis in a predetermined direction, that modulates a phase of the linearly polarized light output from the linearly polarized light output section;

10 a second phase modulation section, having a second polarization axis orthogonal to the first polarization axis, that modulates the phase of the linearly polarized light output from the linearly polarized light output section;

a signal supply section that supplies a modulation
15 signal having a predetermined amplitude for modulating the phase of the linearly polarized light to one of the first and the second phase modulation section;

a light intensity detection section that detects an intensity of a light emitted from the first and the second
20 phase modulation section, to which the signal is supplied from the signal supply section, and transmitted by a sample containing an optically active material that rotates a polarization plane of the light; and

an optical rotation angle calculation section that
25 calculates an optical rotation angle by the sample based on the modulation signal supplied from the signal supply section and the intensity of the light detected by the light intensity detection section.

30 2. The optical rotation angle measuring apparatus according to claim 1, wherein

the signal supply section supplies a preset offset signal to the first and the second phase modulation

sections.

3. The optical rotation angle measuring apparatus according to claim 1 or 2, wherein

5 the first phase modulation section includes a first liquid crystal element a liquid crystal orientation direction of which is a direction of the first polarization axis, and

the second phase modulation section includes a second
10 liquid crystal element which is different from the first liquid crystal element and a liquid crystal orientation direction of which is a direction of the second polarization axis.

15 4. The optical rotation angle measuring apparatus according to claim 3, wherein

the first and the second liquid crystal elements are liquid crystal elements manufactured at predetermined manufacturing steps, manufactured on an equal liquid
20 crystal substrate, and equal in structure.

5. The optical rotation angle measuring apparatus according to claim 4, wherein

the first liquid crystal element is a liquid crystal
25 element manufactured in an arbitrary position on the liquid crystal substrate, and

the second liquid crystal element is a liquid crystal element manufactured near the first liquid crystal element on the liquid crystal substrate.

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6. The optical rotation angle measuring apparatus according to any one of claims 3 to 5, wherein

the first and the second liquid crystal elements are

homogeneous alignment-type liquid crystal elements.

7. The optical rotation angle measuring apparatus according to claim 3, wherein

5 the first and the second liquid crystal elements include electrode substrates and counter substrates between which liquid crystals are held, respectively, and are equal in the liquid crystal orientation direction and equal in structure, and

10 the first and the second liquid crystal elements are arranged in series to an optical path from the linearly polarized light output section to the light intensity detection section so that the liquid crystal orientation direction of the first liquid crystal element is orthogonal
15 to the liquid crystal orientation direction of the second liquid crystal element.

8. The optical rotation angle measuring apparatus according to claim 7, wherein

20 the first and the second liquid crystal elements are arranged so that the electrode substrates or the counter substrates of the respective liquid crystal elements face each other.

25 9. The optical rotation angle measuring apparatus according to claim 3, wherein

at least one of the first and the second liquid crystal elements includes:

30 a rectangular first substrate including a first electrode;

a rectangular second substrate including a second electrode, the liquid crystal held between the first electrode and the second electrode;

a first input electrode for inputting the signal from the signal supply section to the first electrode; and

a second input electrode for inputting the signal from the signal supply section to the second electrode, wherein

5 the first and the second input electrodes are provided near one end side of the second substrate along the end side, and the first and the second input electrodes are also provided near an end side other than the one end side of the second substrate.

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10. The optical rotation angle measuring apparatus according to claim 3, wherein

the first liquid crystal element includes:

15 a rectangular first substrate including a first electrode;

a rectangular second substrate including a second electrode, the liquid crystal being held between the first electrode and the second electrode, the second substrate being larger than the first substrate;

20 a first input electrode for inputting the signal from the signal supply section to the first electrode; and

a second input electrode for inputting the signal from the signal supply section to the second electrode,

25 the first and the second input electrodes are arranged in series near one end side of the second substrate along the end side, and the first and the second input electrodes are arranged in series near an end side orthogonal to the one end side of the second substrate,

30 the second liquid crystal is equal to the first liquid crystal in the liquid crystal orientation direction and in structure, and

the first and the second liquid crystal elements are arranged in series on an optical path from the linearly

polarized light output section to the light intensity detection section so that the liquid crystal orientation direction of the first liquid crystal element is orthogonal to the liquid crystal orientation direction of the second
5 liquid crystal element.

11. The optical rotation angle measuring apparatus according to claim 3, further comprising:

10 a liquid crystal element holding section that holds the first and the second liquid crystal elements.

12. The optical rotation angle measuring apparatus according to claim 1 or 2, further comprising:

15 a pair of quarter-wave plates arranged in series on an optical path from the linearly polarized light output section to the light intensity detection section while the sample is held between the pair of quarter-wave plates.

13. The optical rotation angle measuring apparatus according to claim 2, wherein

the first phase modulation section is a first pixel group constituted by a part of a plurality of pixels that constitute a single liquid crystal element, and

25 the second phase modulation section is a second pixel group constituted by pixels other than the part of the plurality of pixels that constitute the single liquid crystal element, the other pixels and the part of pixels being alternately arranged.

30 14. The optical rotation angle measuring apparatus according to claim 13, further comprising:

a condensing section, provided between the first and the second pixel groups and the light intensity detection

section, for condensing the light emitted from the first and the second pixel groups and transmitted by the sample containing the optically active material that rotates the polarization plane of the light, and for emitting the light
5 to the light intensity detection section.

15. The optical rotation angle measuring apparatus according to claim 3, 13, or 14, wherein
the offset signal supplied from the signal supply
10 section is a signal in a section in which a phase modulation amount of the liquid crystal element is linearly changed.